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NORTHERN PATAGONIA

An exceptionally valuable paper, entitled "Recent Surveys in Northern Patagonia," has recently been published by Bailey Willis in the *Geographical Journal* for December, 1912 (Vol. 40, pp. 607-615). The author first calls attention to the policy of the Argentine government toward the building of railroads in the so-called "desert" regions of Patagonia to promote settlement and to change them into populous provinces. One line extends westward from Puerto Deseado in Santa Cruz, another from Rivadavia in Chubut, and a third from Puerto San Antonio in Rio Negro.

It is proposed to carry the Rio Negro line not only to Lake Nahuel Huapi as originally planned, but northward and westward to the port of Valdivia on the Pacific coast. Branch railways will be thrown northward 100 miles to the old settlements of San Martin and Junin de los Andes, and southward 150 miles to the highly interesting and now flourishing colony of Welsh settlers in the Valley of the 16th of October (longitude 71° 30′ west, latitude 43° south).

The topography of northern Patagonia is comparable to that of the High Plains of Kansas and Texas, and the climate to that of parts of Arizona. Though large portions of the region have little economic value, there are extensive valleys and basins which will, in time, become centers of population.

In the belt of country along the east coast the rainfall varies from eight to twelve inches per annum; it then diminishes westward about half way across the continent and again increases toward the mountains. The port of San Antonio and the railroad formerly depended entirely upon rainwater collected in cisterns or on that pumped from wells sunk in the sandhills along the coast. Sixty-eight miles inland, at Arroyo Valcheta, a clear, perennial stream was found from which water is now hauled daily to the city in tank cars. A well at San Antonio and another at kilometer 62 were unsuccessful, though they were drilled to depths of 345 and 886 feet respectively.

So condensed is the description of the geomorphology of the region and its relation to the all-important question of a water supply, that we can do no better than to quote the essential portions of it.

> "Northern Patagonia is an old, deeply eroded, continental mass, composed of metamorphic slates, . . . cut by eruptive granites and rhyolites. Over this basement occur thin marine and fresh-water sediments, . . . capped by flows of basalt and andesite, and . . . irregularly distributed in more or less extensive remnants. Near the coast are younger . . . clay and gravel deposits, with layers of secondary limestone.
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> "As these conditions exclude the possibility of finding a water supply for the city and railway by artesian boring, attention was turned to the Arroyo Valcheta, the clear, constant stream already referred to, and it was found that the waters could be impounded in a reservoir from which they would flow to San Antonio by gravity.
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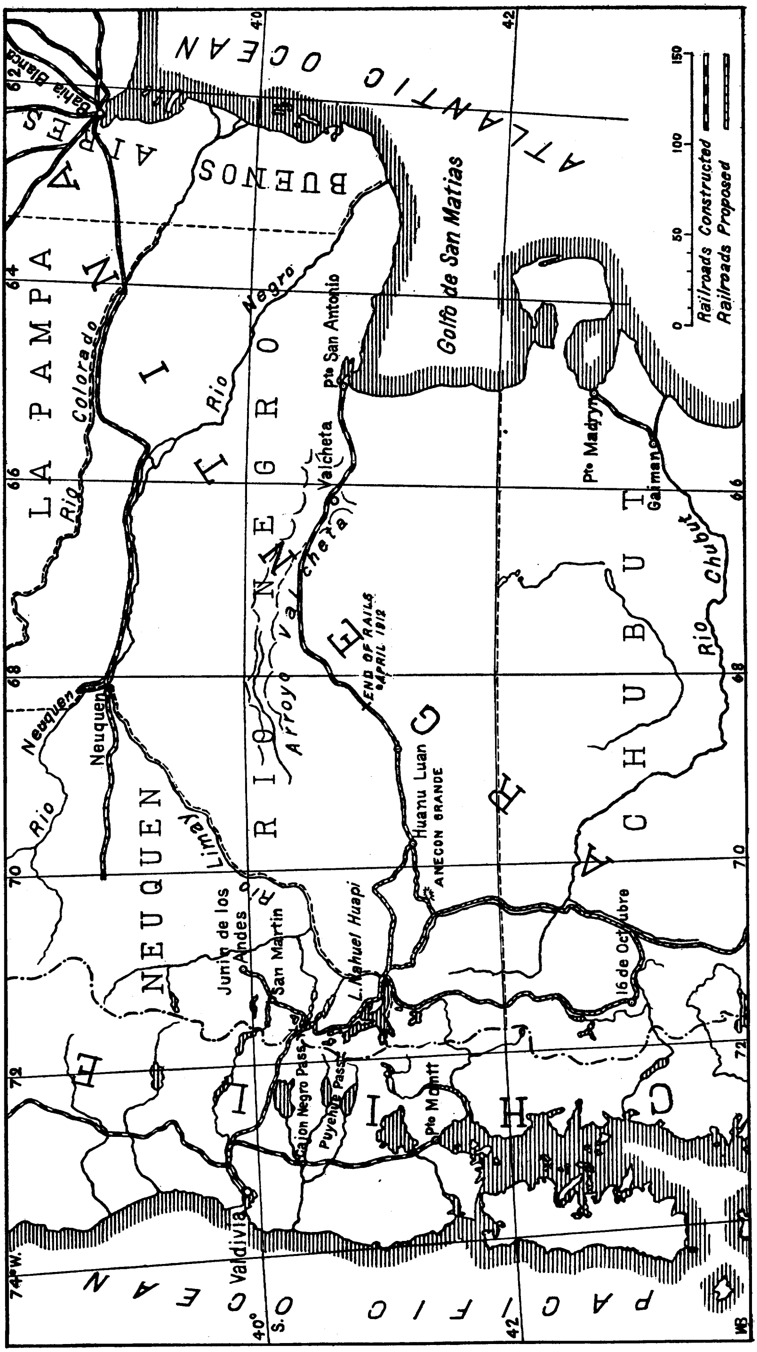
> "The Arroyo Valcheta is of a type common in the warped plateaus of Patagonia. Its waters gather from rain and snow in elevated lava fields, 1,000 meters (3,281 feet) or more above the sea, and finding no well-defined surface channels trickle underground till they issue in large springs at the base of the bold escarpment. Thence the stream flows in meadows and swamps, constantly losing by evaporation in its course, and finally dies in a salt lake in



Sketch Map of Railroads in Northern Patagonia, based on a map in the *Geographical Journal*, Vol. 40, 1912, p. 609. Scale 1:7,000,000.

a basin without outlet to the sea. The diversion of a part of its waters to a reservoir will redeem a large area suitable for growing alfalfa and turn a waste into use, as well as provide the necessary supply for the railway and San Antonio, for which no other source seems available.

"In crossing the continent the railway rises from the Atlantic, not by a series of terraced steps, as has often been described, but by passing across interior basins from one plateau to another, the continental surface being warped, so that basins without outlets to the sea range from south-east to north-west between high plains."

About midway of the continent is a depressed area 2,900 feet above the sea, and to the west of it is a conspicuous mass of volcanic peaks, of which the highest, Anecon Grande, exceeds 6,560 feet in altitude above the sea.

"The peaks are bold, rocky remnants of ancient volcanoes, long since stripped of cinder and ash deposits, which are spread about them and to a great extent covered by later basalt flows."

This mesa-like surface between 3,900 and 5,200 feet above the sea is cut by valleys and canyons 300 to 600 feet deep, which radiate from Anecon Grande and shed their waters to the Limay on the north and the Chubut on the south.

The difficulties of the railroad route were greater in the regions of mesas and canyons and on the plateau than in the Andes themselves; consequently a well-constructed map on the scale of 1:100,000, with 66-foot contour intervals, has been begun. There are two passes into Chile from the Lake Nahuel Huapi region in Argentina. One is known as the Puyehue Pass, long ago used by Indians and Spaniards and in recent years by settlers; the other is El Cajon Negro.

"The approach to Puyehue pass is by profound gorges, overhung by cliffs that suggest Yosemite scenery; the ascent could be accomplished only by steep grades; and the summit being broad, almost plateau-like, the line would be exposed for a long stretch to obstruction by winter snows at an elevation of 1,200 to 1,300 meters (3,937-4,265 feet). The Cajon Negro, on the other hand, can be reached by moderate grades, through beautifully forested valleys, past exquisite lakes, and the crest of the Sierra can be pierced by a tunnel about a mile in length at an elevation of 1,180 meters (3,873 feet) above sea" (p. 614).

The territory of Rio Negro comprises two distinct regions—the treeless pampas which extend from the Atlantic to the foothills of the Cordillera and are adapted to sheep and cattle-raising, and the Cordilleran district, adapted to intensive farming and manufacturing, and which will therefore become the seat of a future dense population. But a small portion of the first region can be irrigated, while the abundant rainfall of the second region and its mild climate, large rivers, beautiful lakes, and great waterpowers, give it practically all the essential physical features which man requires for his best development.

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